

*Proposed*  
Protected Instream Flows (PISF)  
for the Souhegan River  
Designated Reach

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University of Massachusetts  
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Milford, NH

# The Completed Efforts to Date

- Who are the “players” – IPUOCR identification
- Which are “Flow-Dependent” IPUOCR?
- Are there Groundwater Effects?
- Methods to Assess the Flow Needs of Each Flow-Dependent IPUOCR
- PISF Assessments and Report

**IPUOCR – Instream Public Uses, Outstanding Characteristics, and Resources**

# PISF Assessments and Report

- The IPUOCR, location, water needs
- IPUOCR evaluation methods and results
- How the river meets the proposed PISF
- Identify river reaches that do not meet the proposed PISF
- TRC presented these results and then review and comment



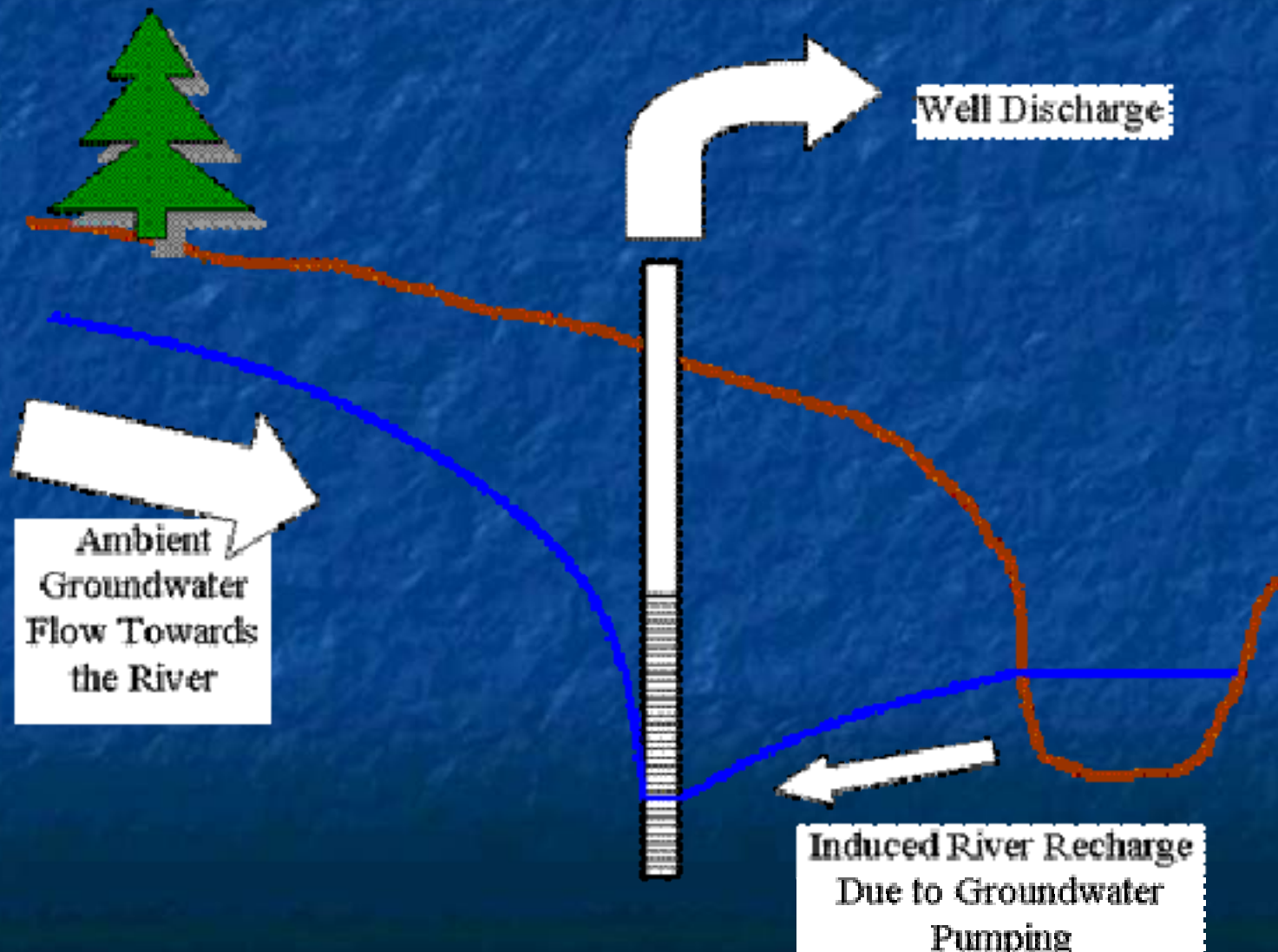
# Flow-Dependent IPUOCR Classes

- Human
- Fish
- Rare, Threatened, and Endangered Species (RTE)

# Groundwater Effects

Three of the studied wells induce recharge

# Induced Recharge to be Considered in the Management Plan





# Methods to Determine the IPUOCR Flow Needs

- Human – Surveys, regulations, interviews
- Fish – Field surveys, reference communities, target communities, modeling
- RTE - Field surveys, reference communities/habitat needs

# Proposed PISF for Each IPUOCR

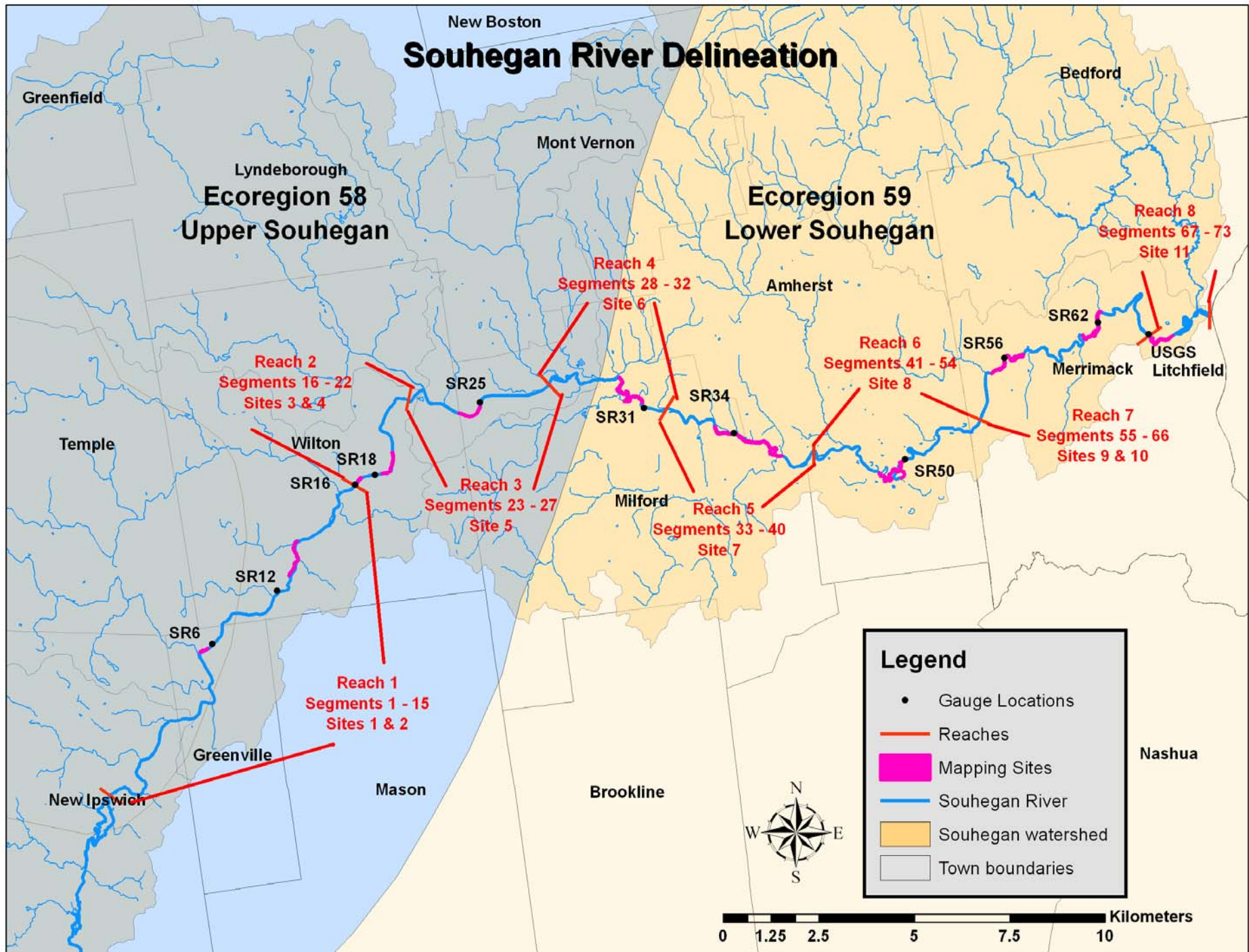
Each IPUOCR possess water (river flow) needs that may vary throughout the year and vary along the river.



# Units of Flow

- Typically measured and reported at a specific location as *cubic feet per second* (cfs)
- Normally, river flow increase in the downstream direction as more tributaries and baseflow join the main stem
- To compare flows from one location along the river to another, flow is divided by the watershed area at the point of interest. Watershed area is measured in square miles.
- The units of flow divided by watershed are *cubic feet per second per square mile* (cfsm)

# Souhegan River Delineation





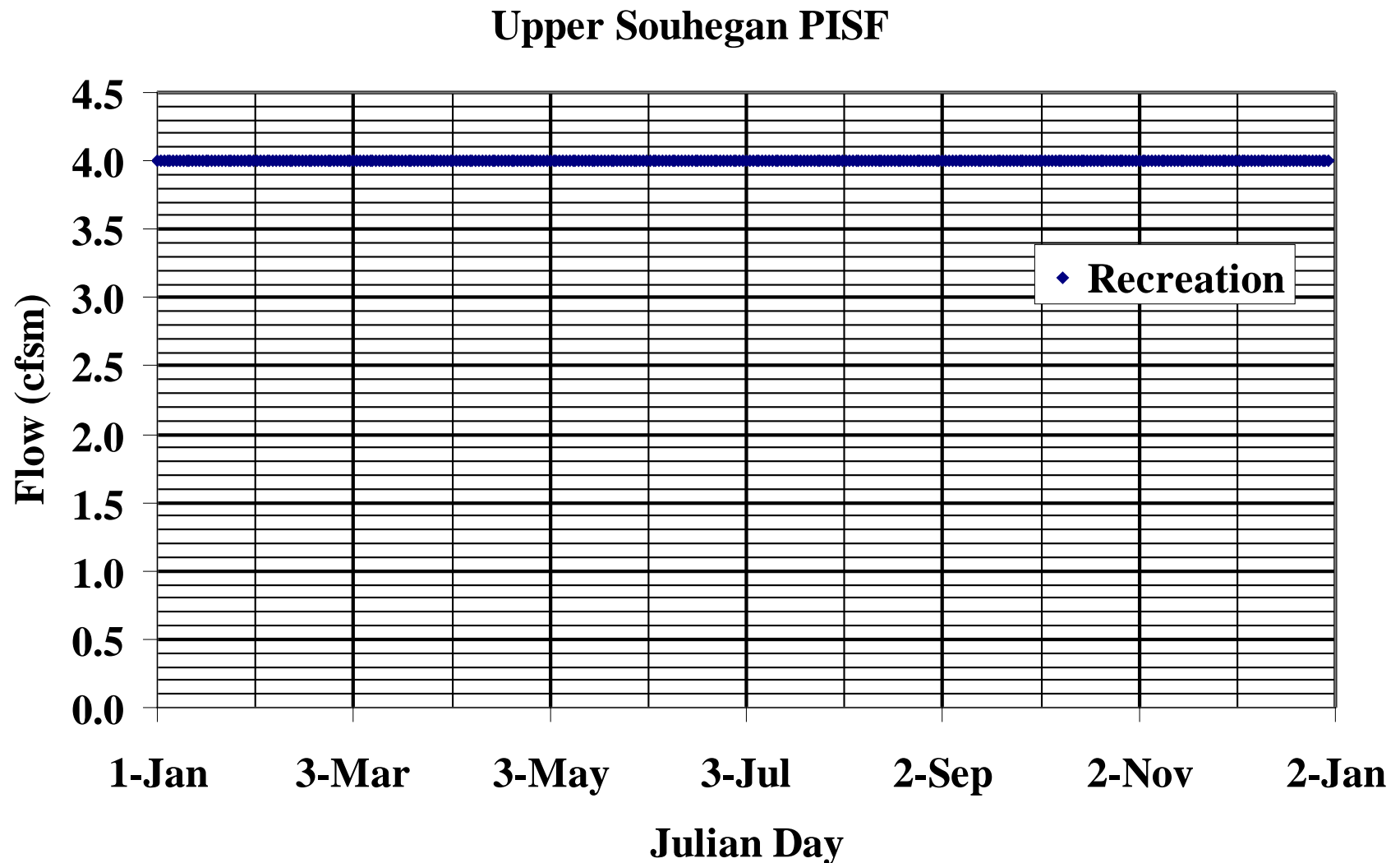
# Example of an IPUOCR PISF

## Recreation

4 cfs in Reaches 1 and 2 (Upper Souhegan)



# Graphical Presentation of the IPUOCR Flow Need



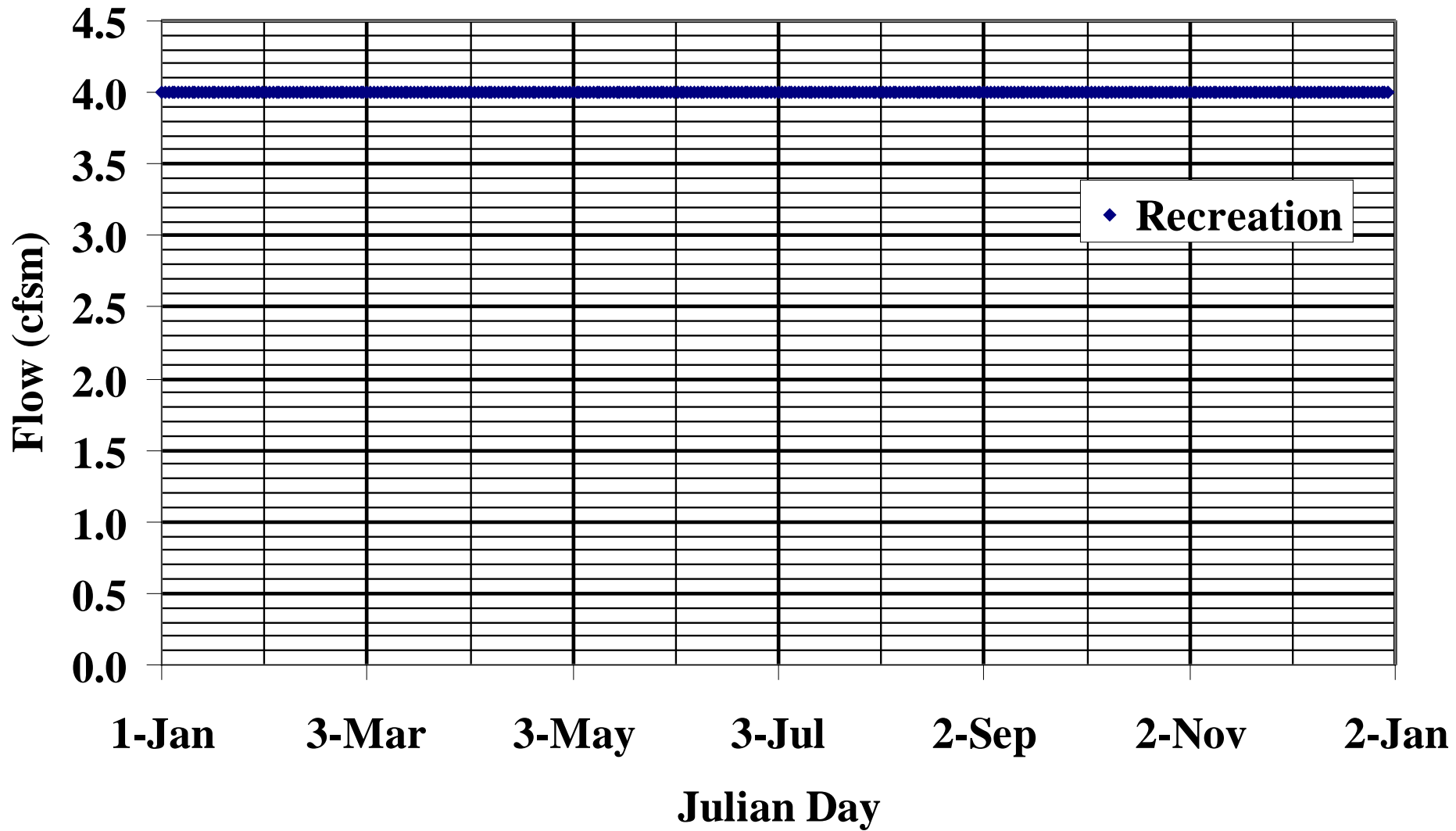
# Fish PISF

- Common Flow – Very good habitat, frequently occurring
- Critical Flow – Not much quality habitat, frequency of occurrence 2-3 years
- Rare Flow – very little habitat, decadal frequency

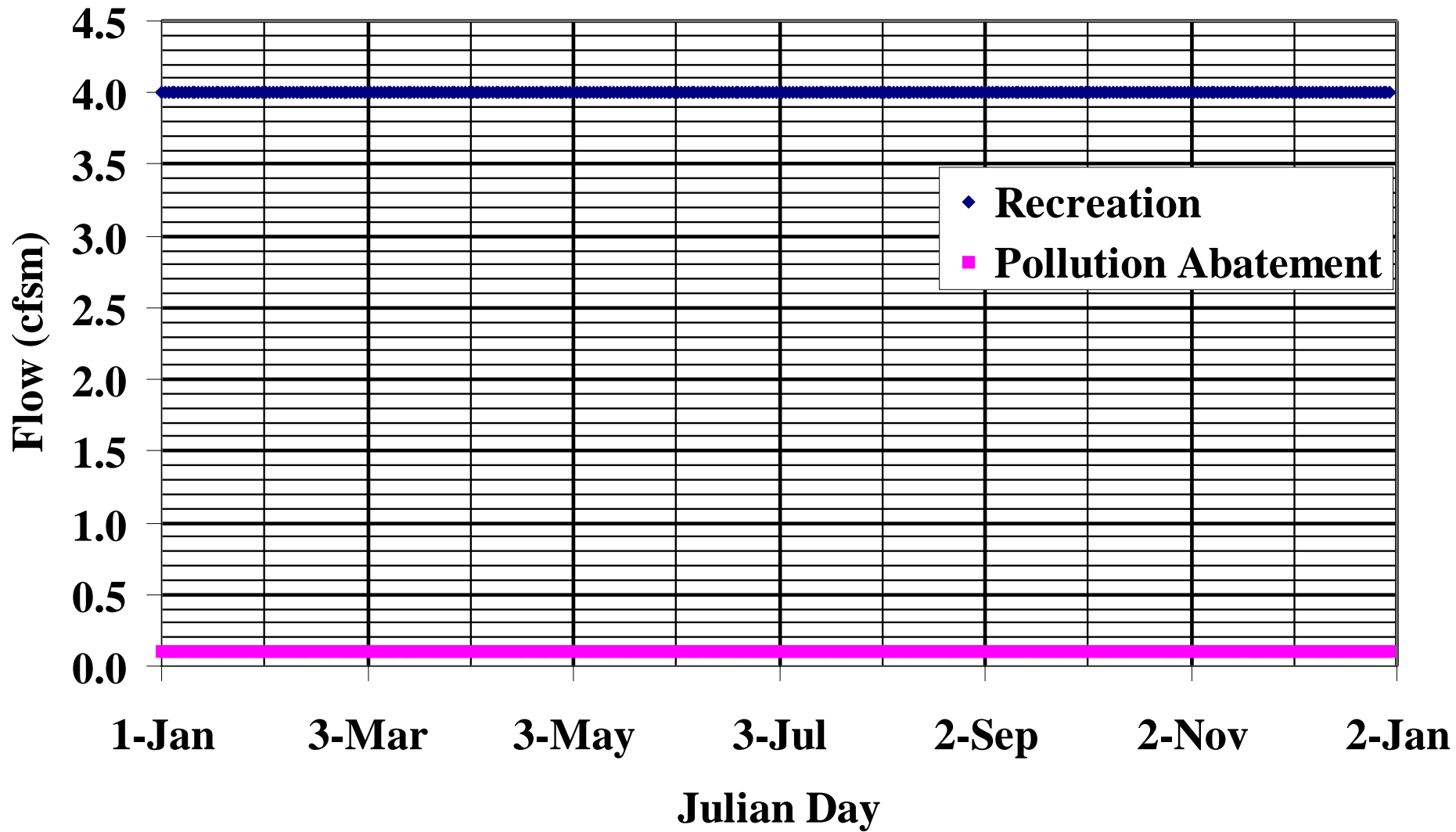
All PISF Are Overlaid to Understand  
which IPUOCR Flow is the Strictest  
(and When)



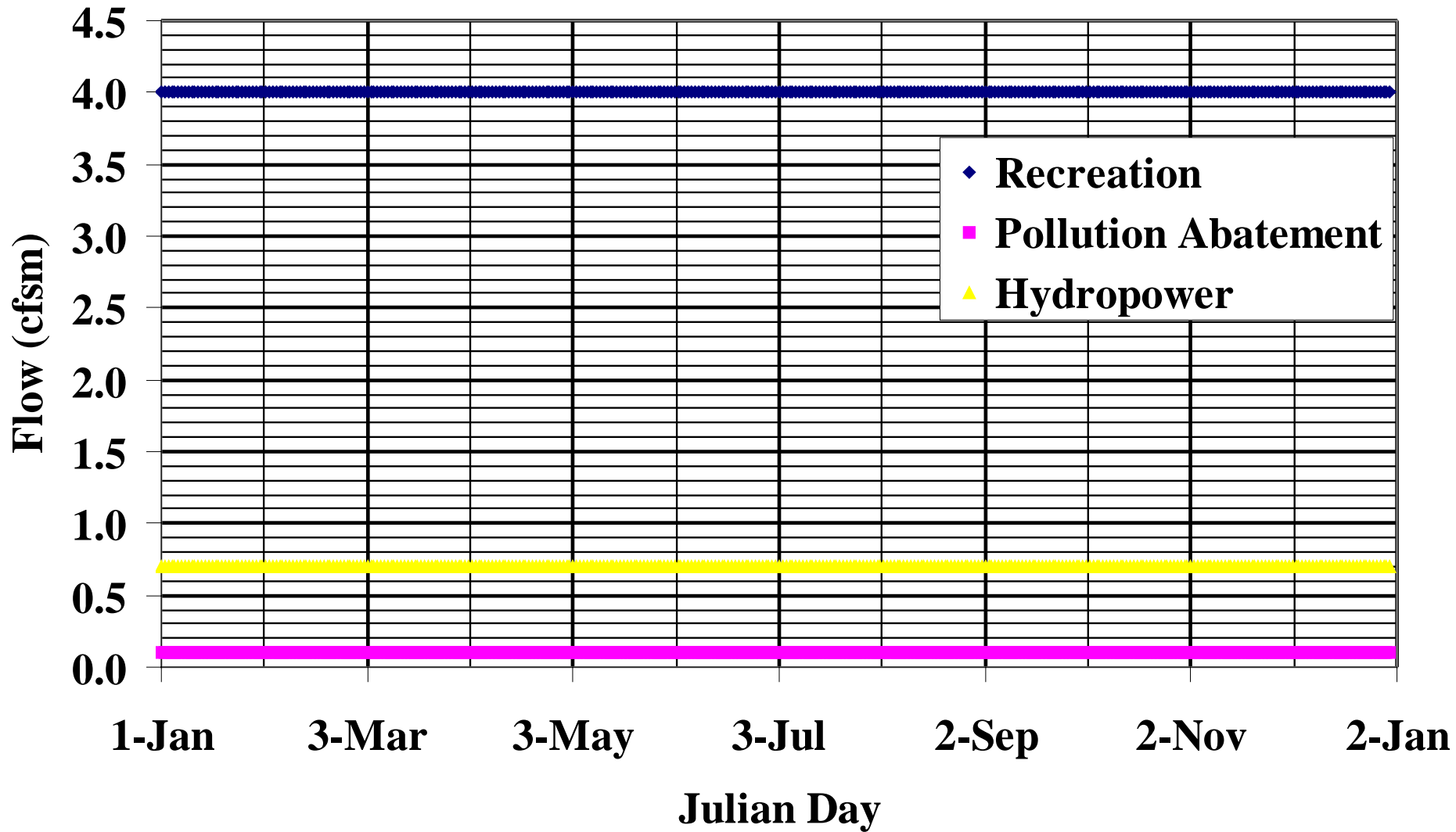
## Upper Souhegan PISF - Common Flows



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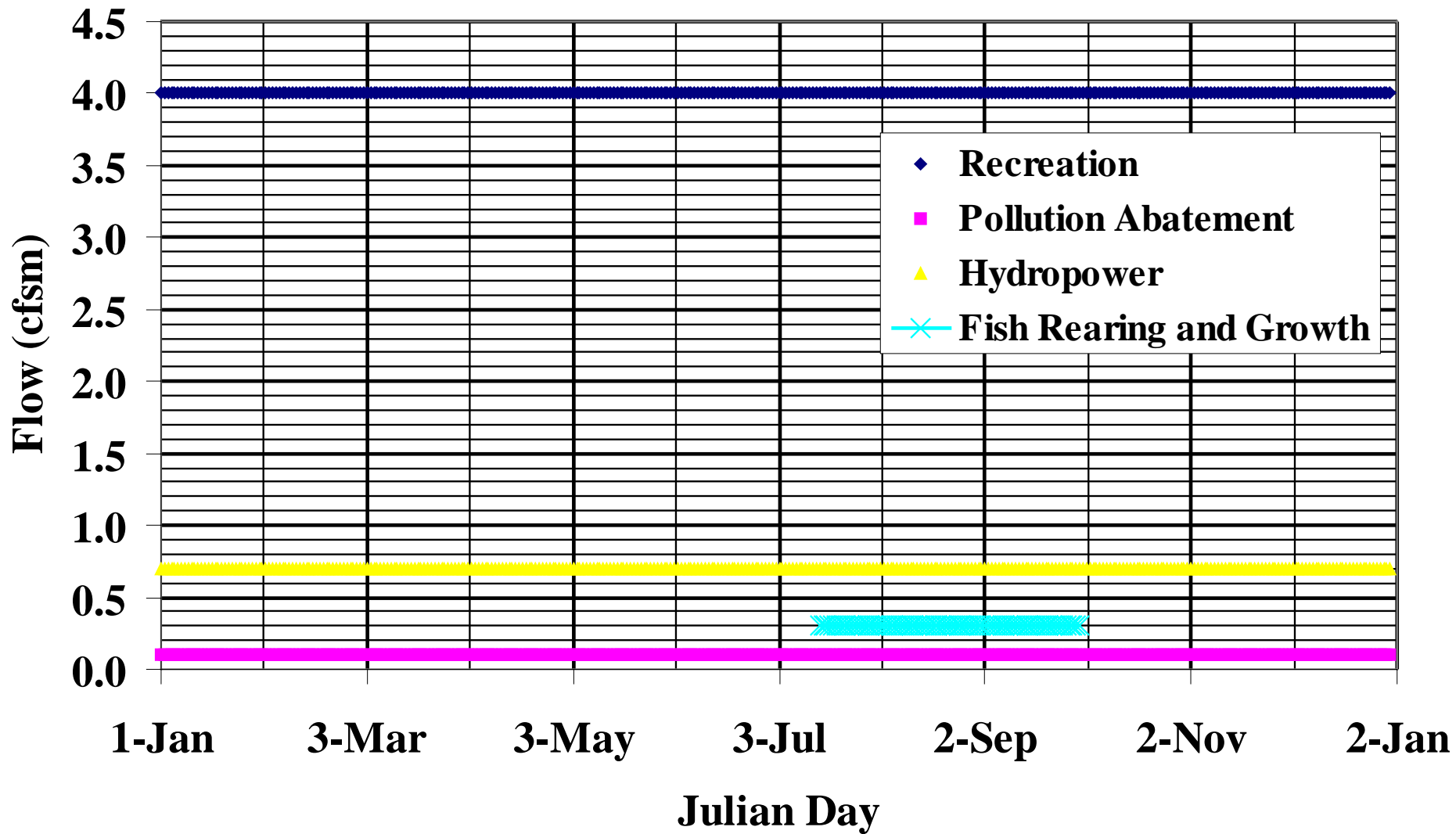


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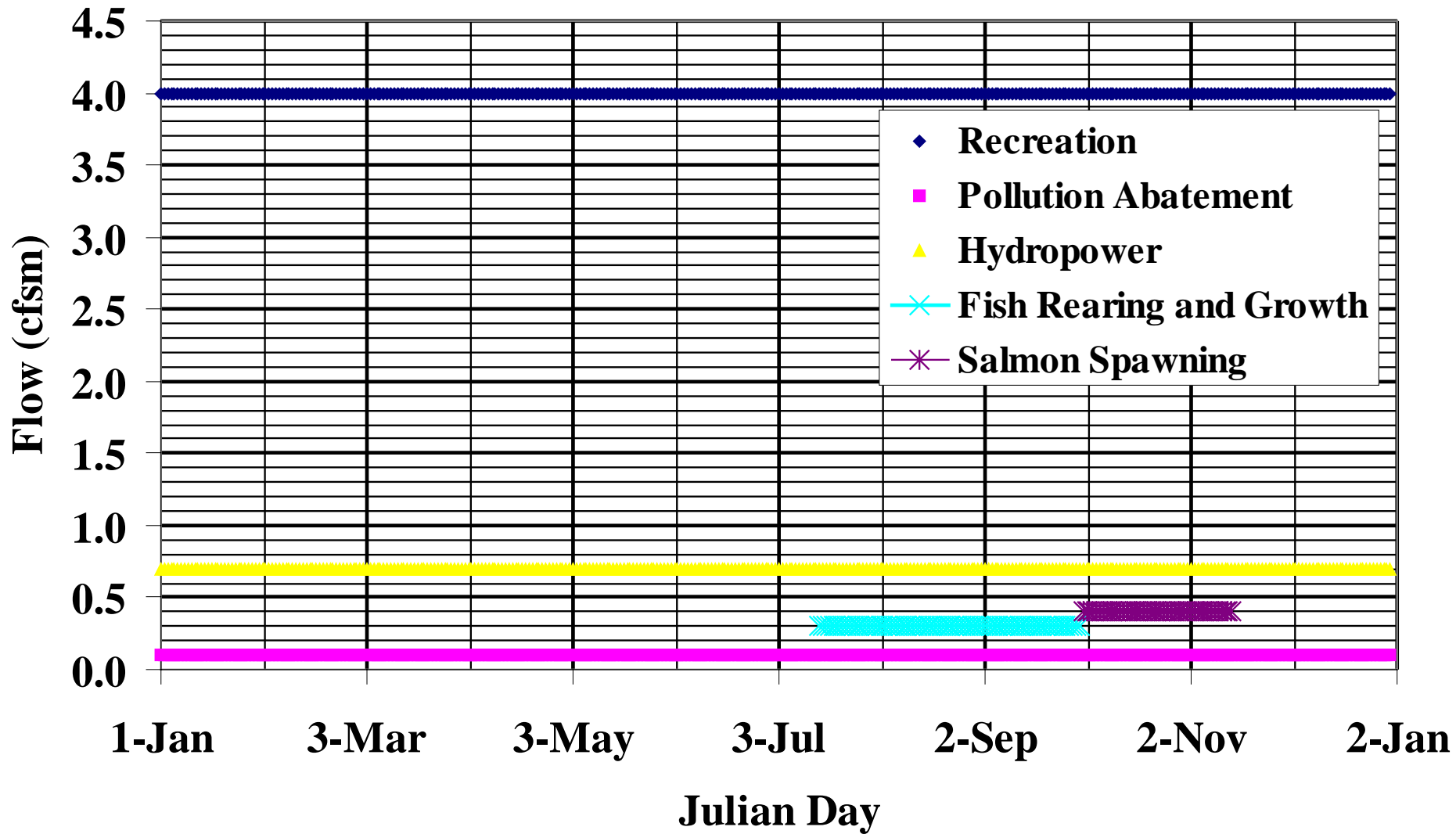




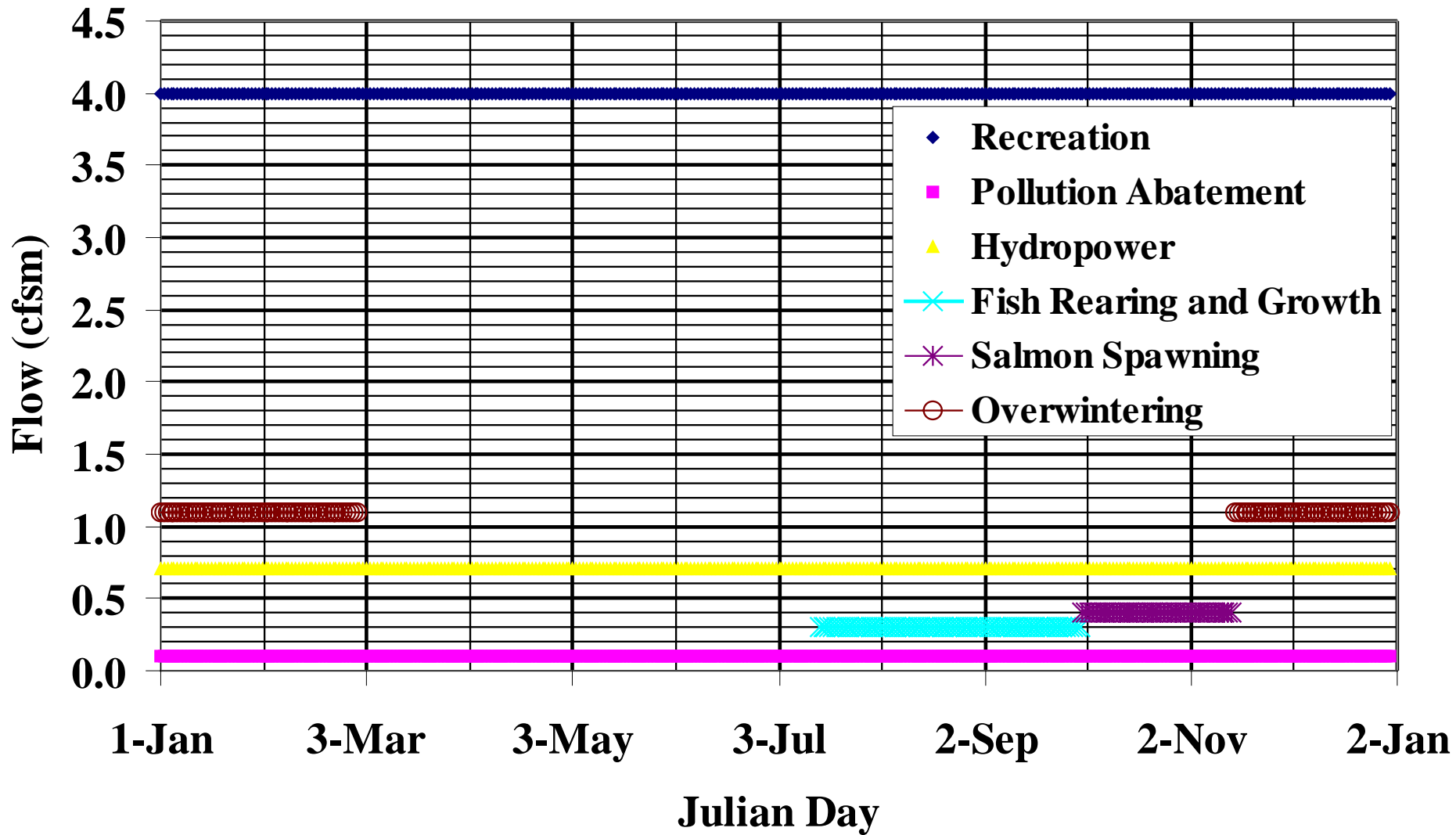
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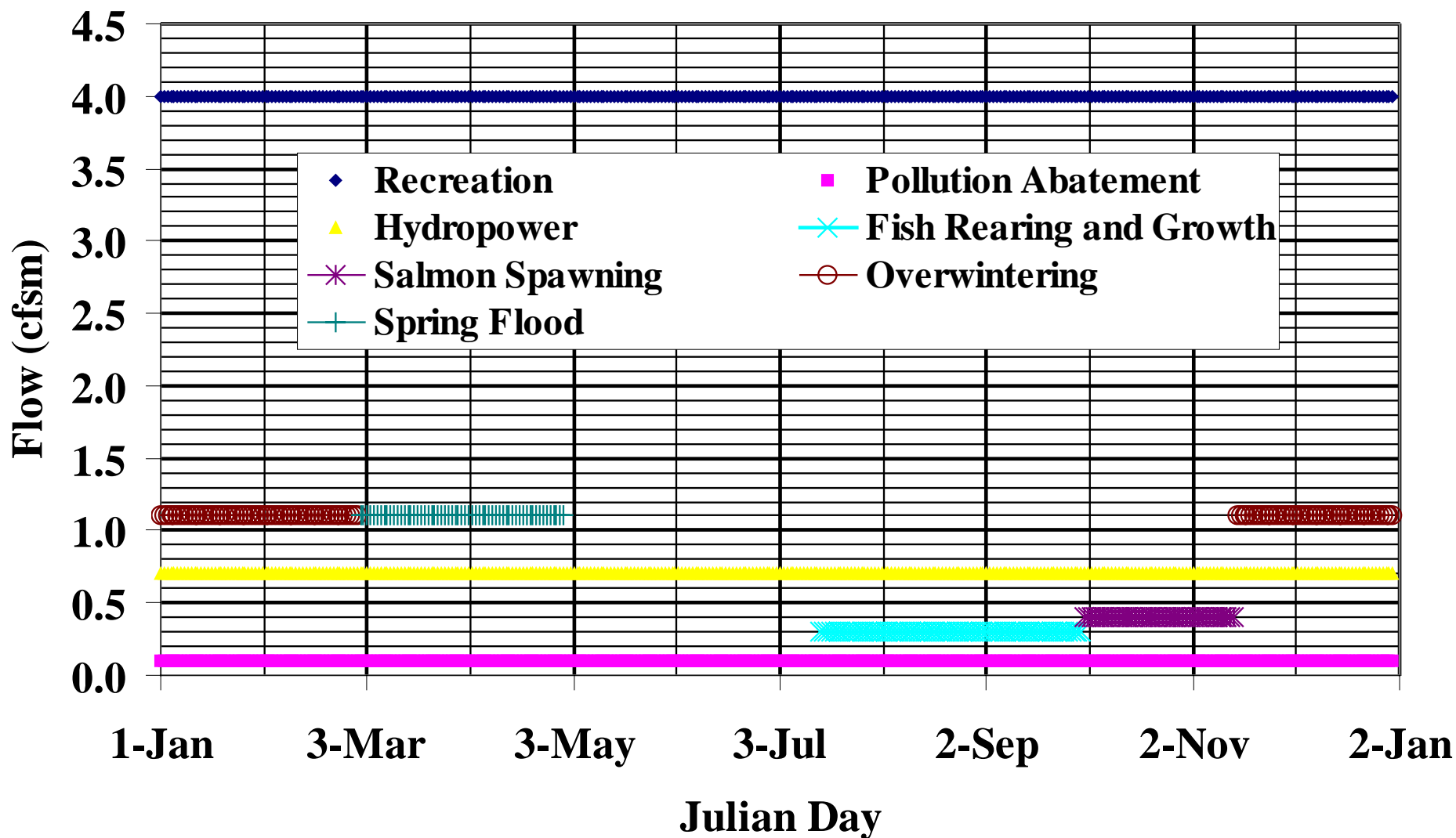


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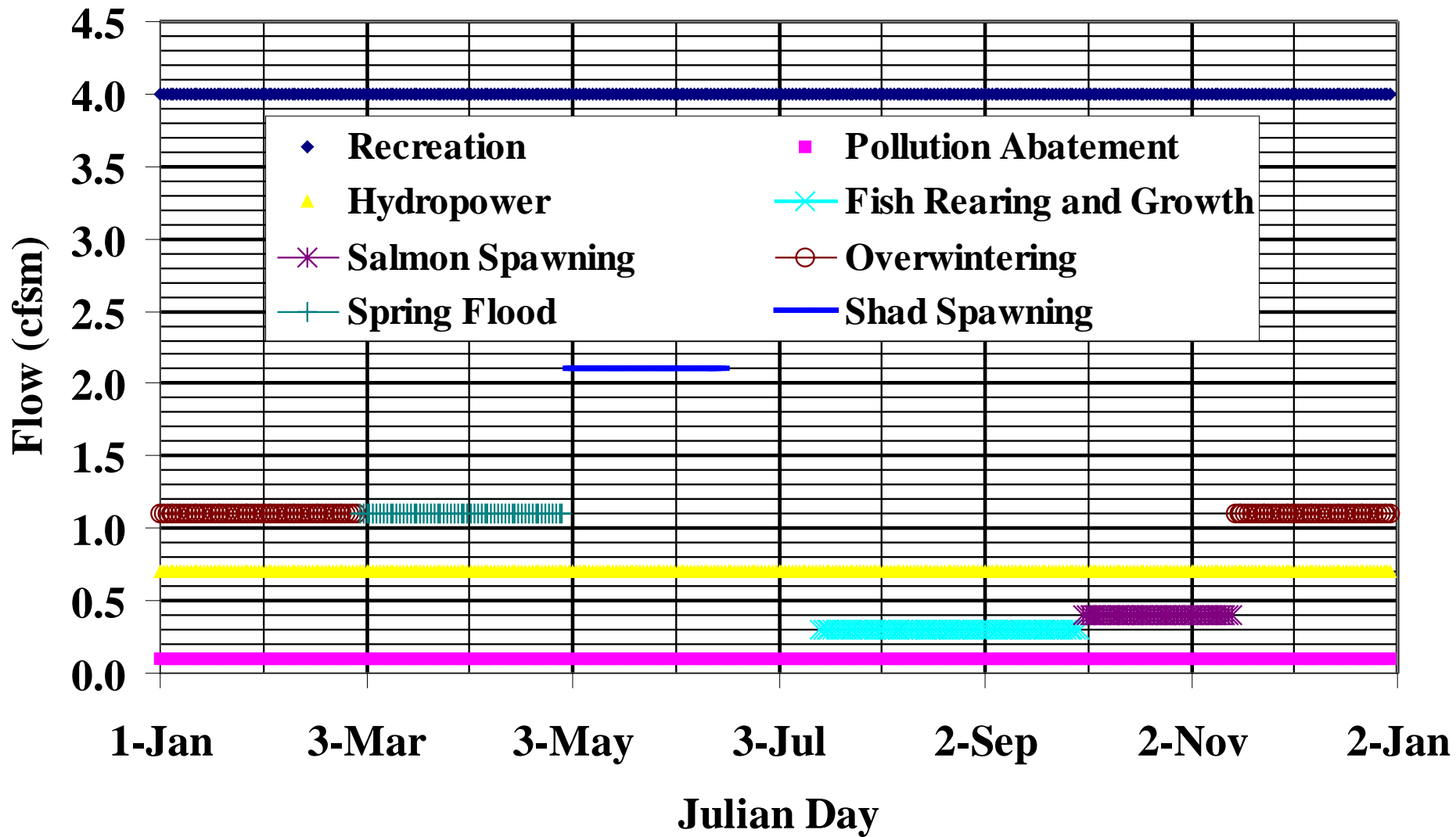




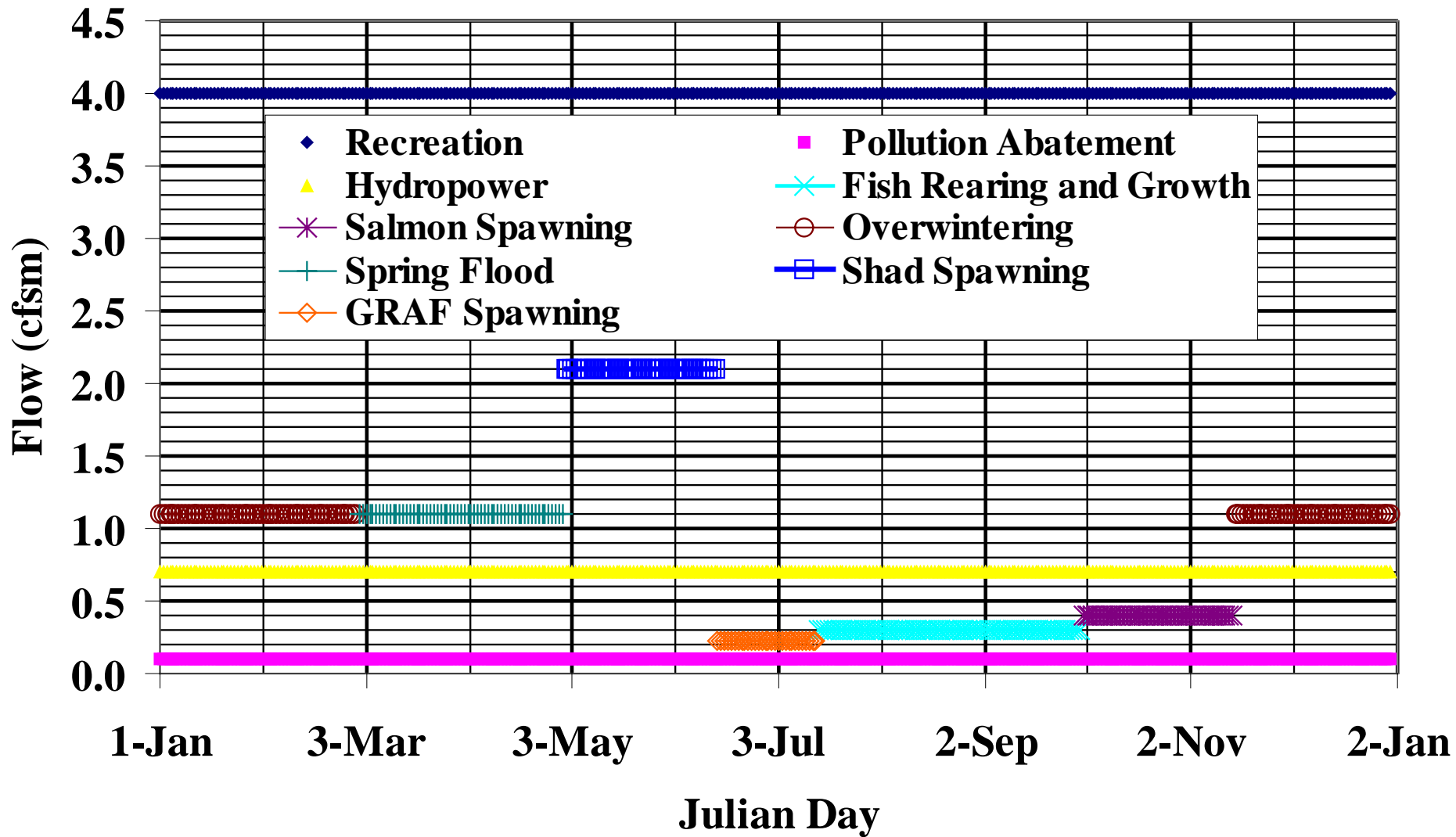
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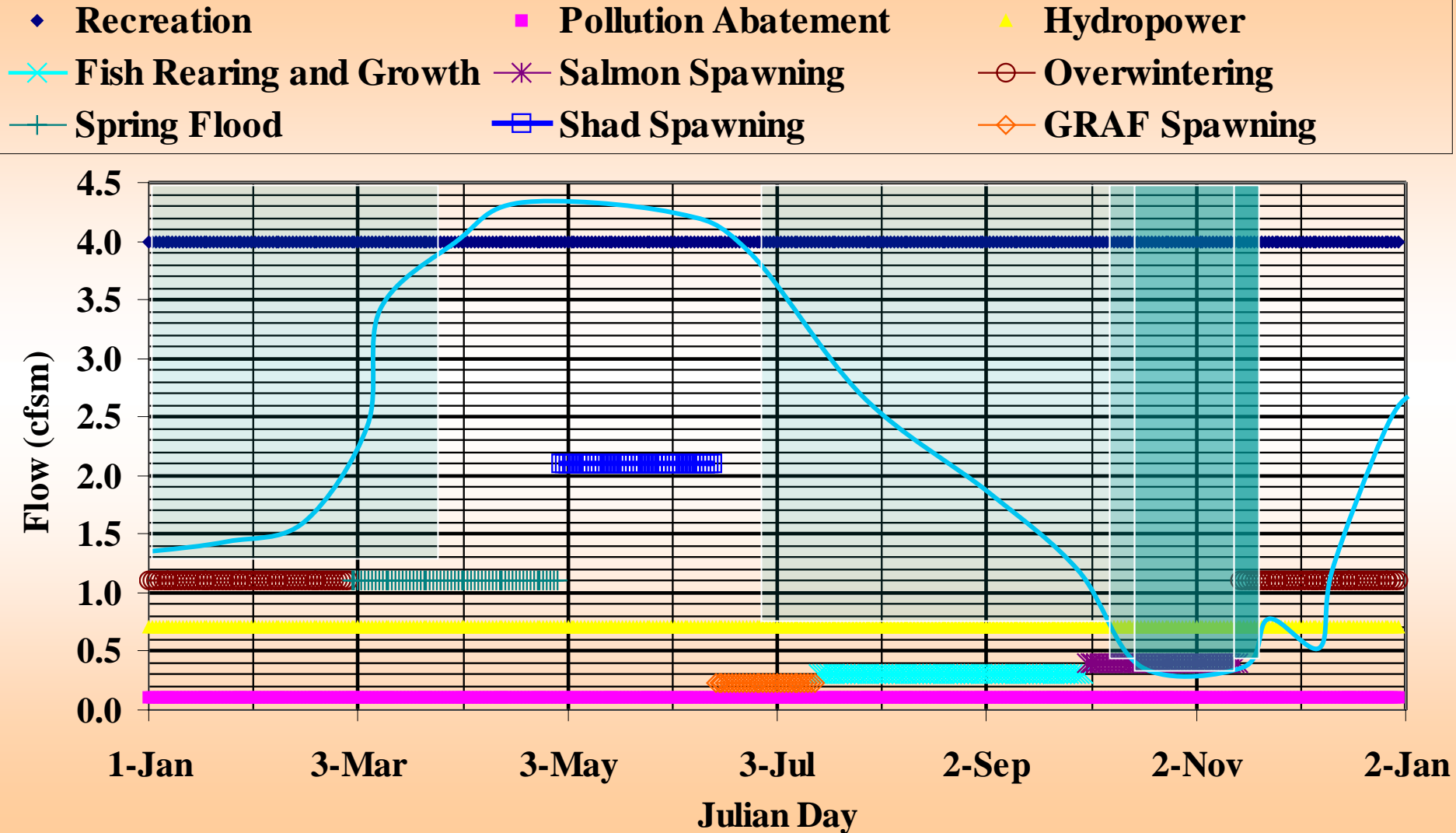
## Upper Souhegan PISF - Common Flows



By satisfying the highest of these PISF, all others are satisfied: the most IPUOCR are protected when flow in the river equals or exceeds the highest of these PISF



## Upper Souhegan PISF - Common Flows



# Synthesized PISF

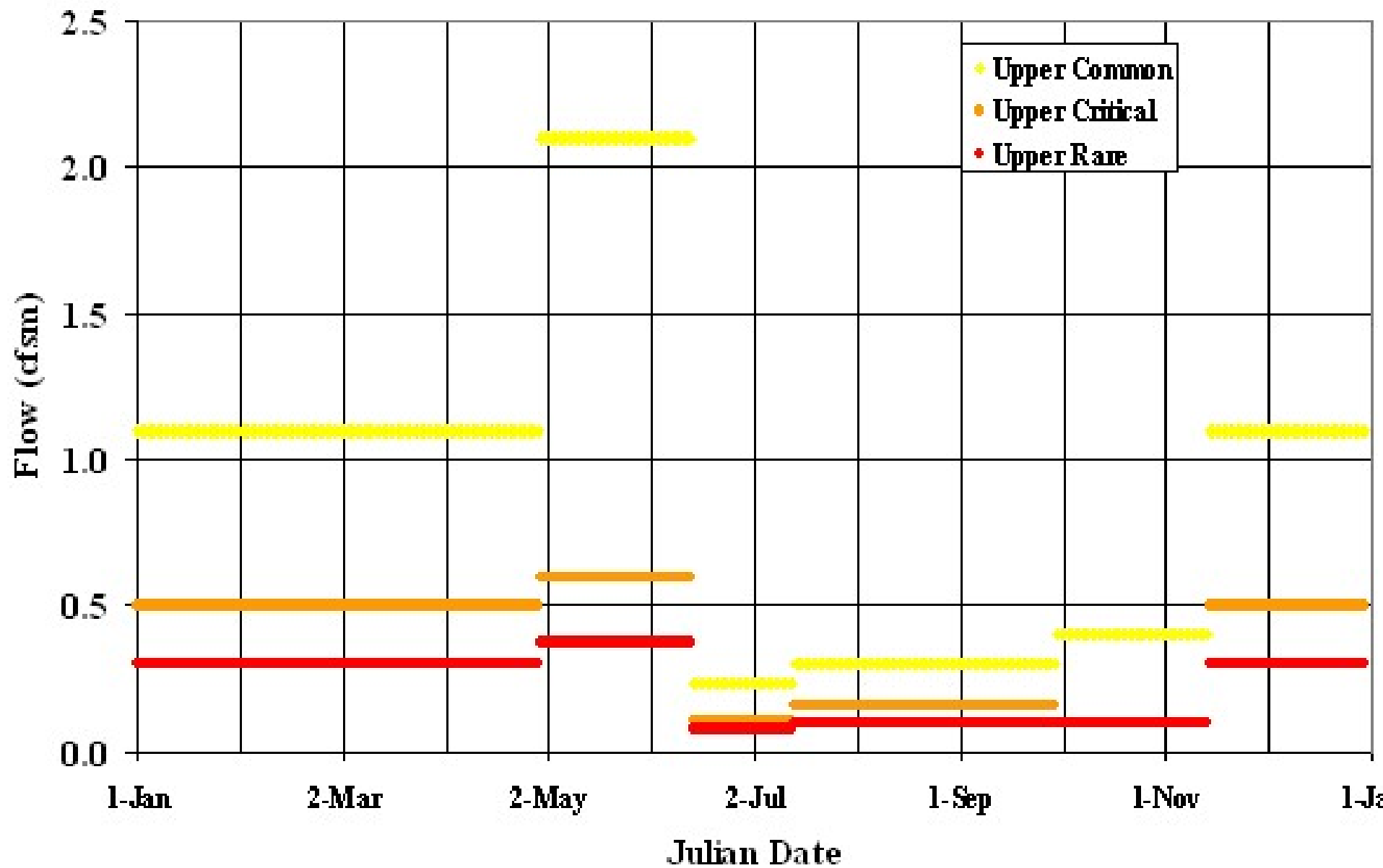
When comparing the PISF need for each IPUOCR for every day of the year, on the low flow end, the largest of the individual IPUOCR PISF controls: meeting that PISF means that all other PISF are met.

Human needs (recreation and hydropower) are the largest of the low flow PISF.

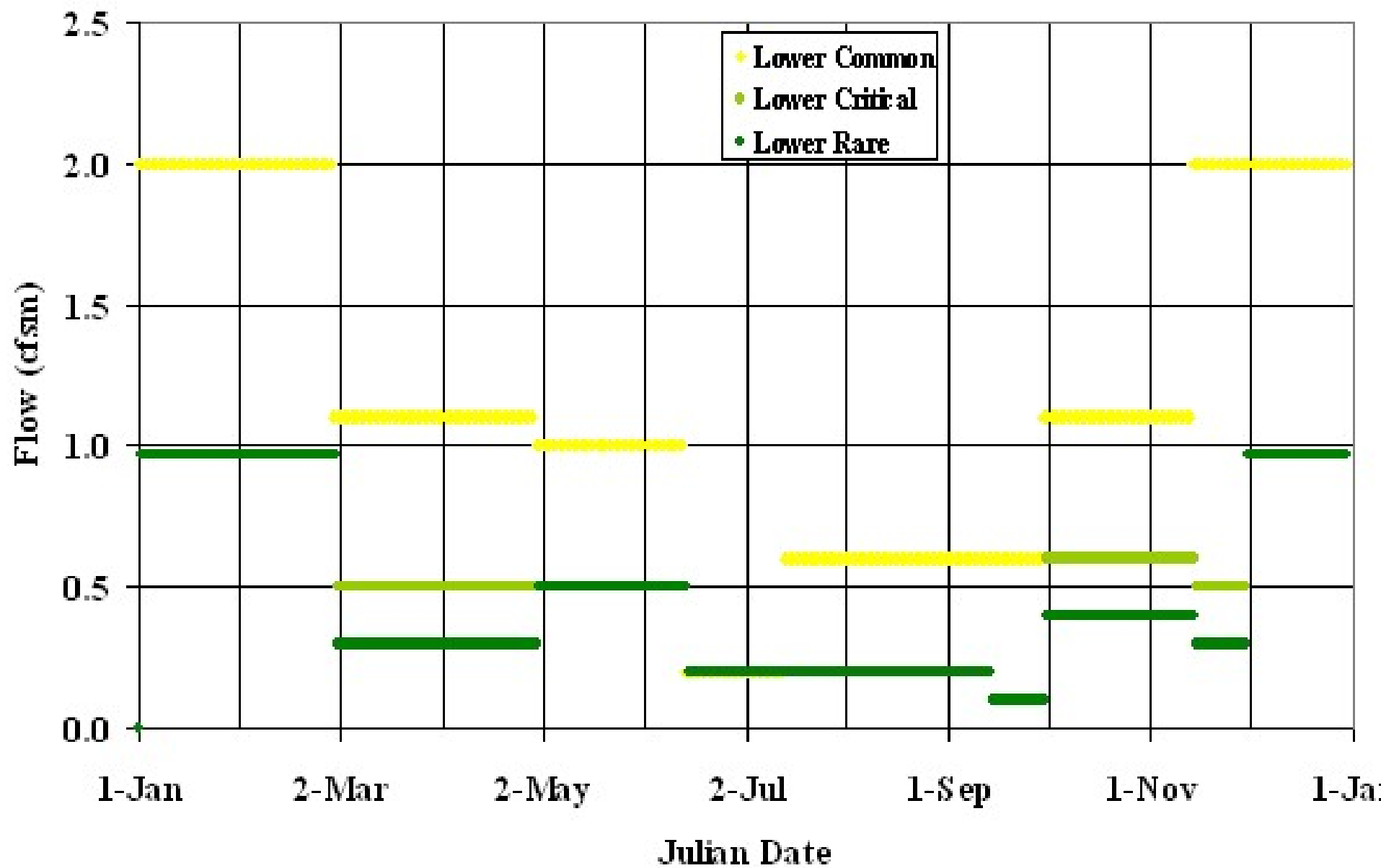
# Achievable Synthesized PISF

The river system has very little conservation storage (stored water that could be released over long periods) to meet human PISF.

It was decided that the human PISF would be met as they have been historically: “run-of-river”, and therefore subsequent water management strategies will focus on the non-human, synthesized PISF.







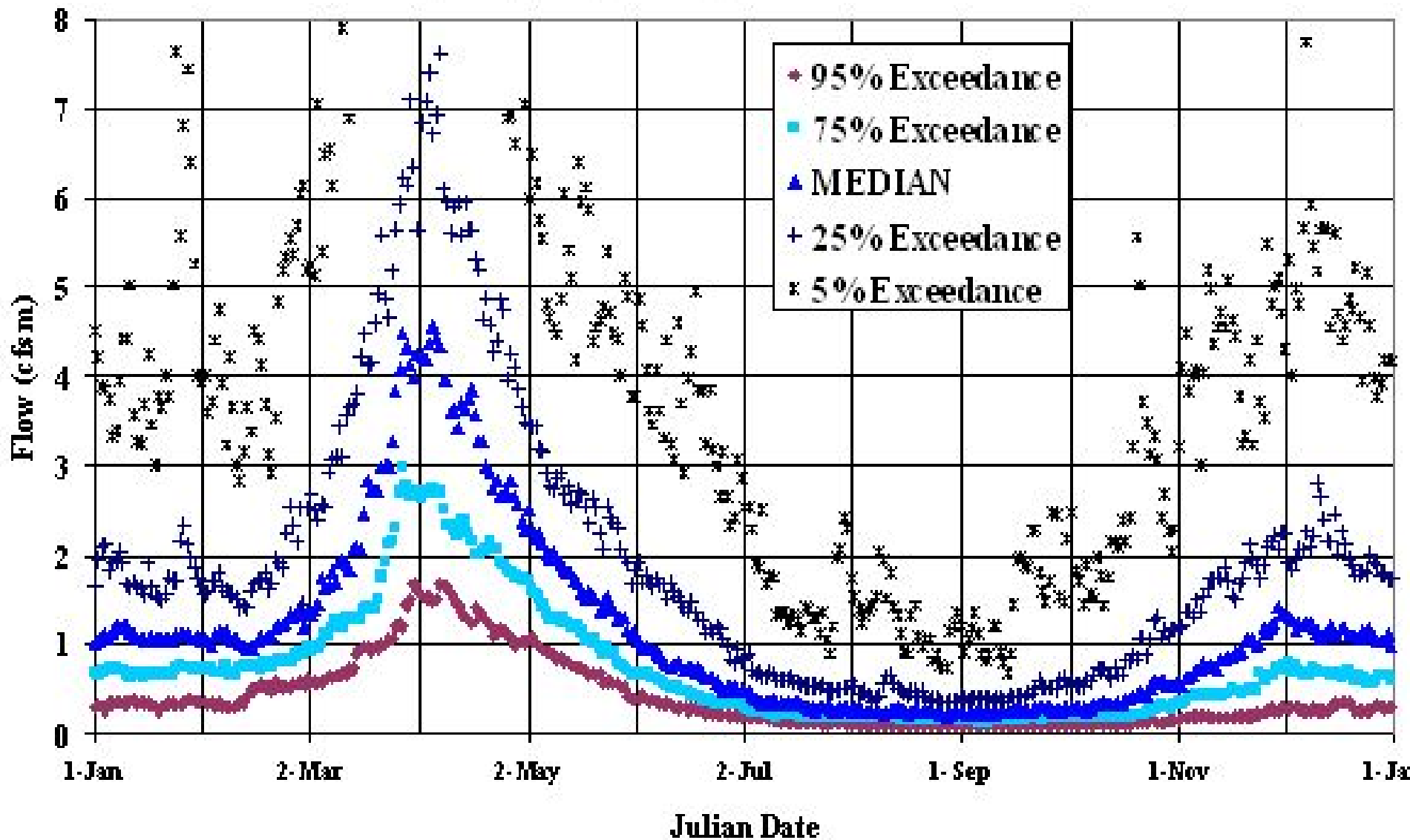
# Comparison of the Proposed PISF to River Flow

- Generate Hydrology
- Compare River flow to synthesized PISF
- Determine characteristics of when the river flow does not meet the PISF

# River Hydrology

- USGS Gage Data
- Concurrent flow measurements
- Statistical re-creation of flow at various locations along the river

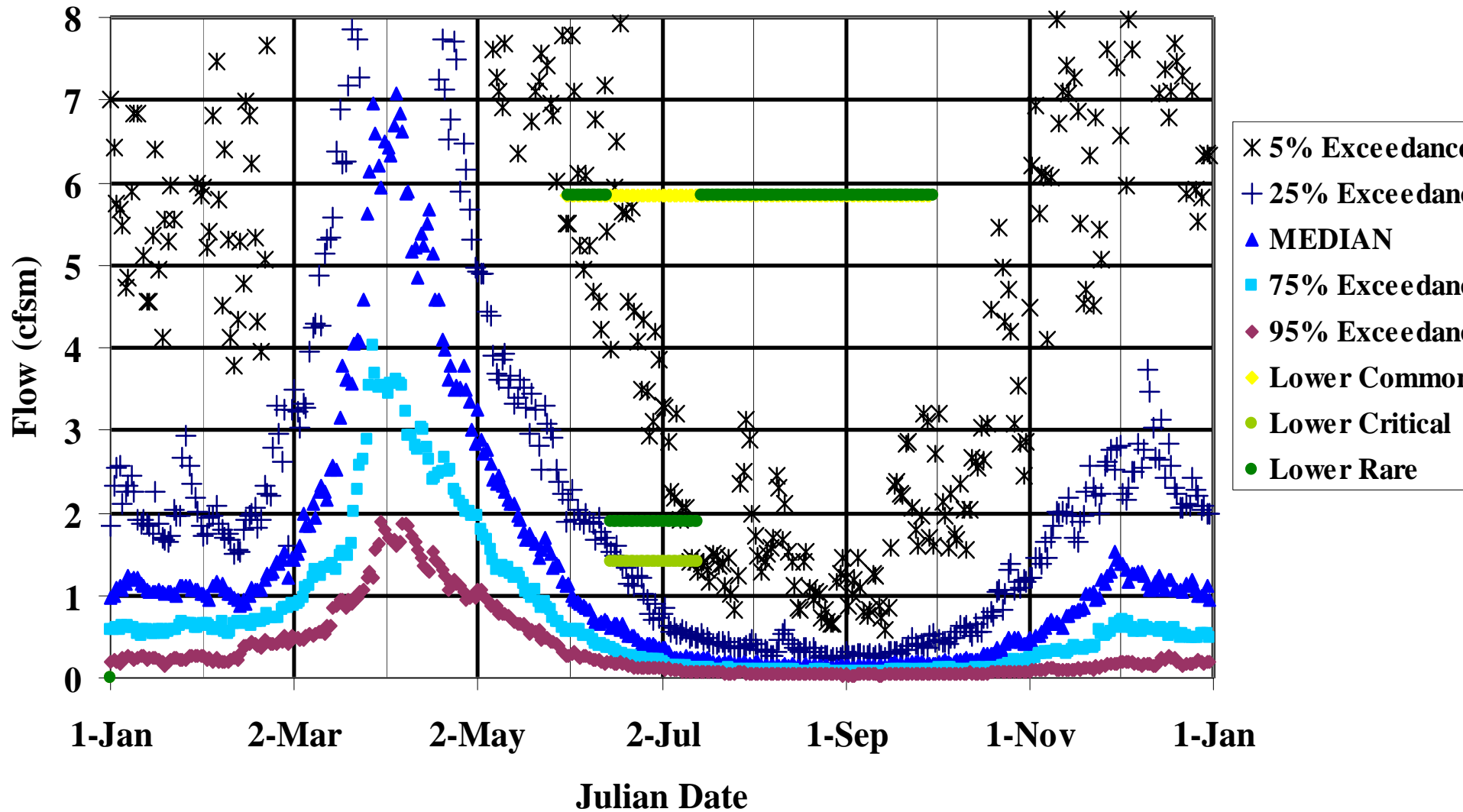
## Daily Frequency Souhegan River at Merrimack

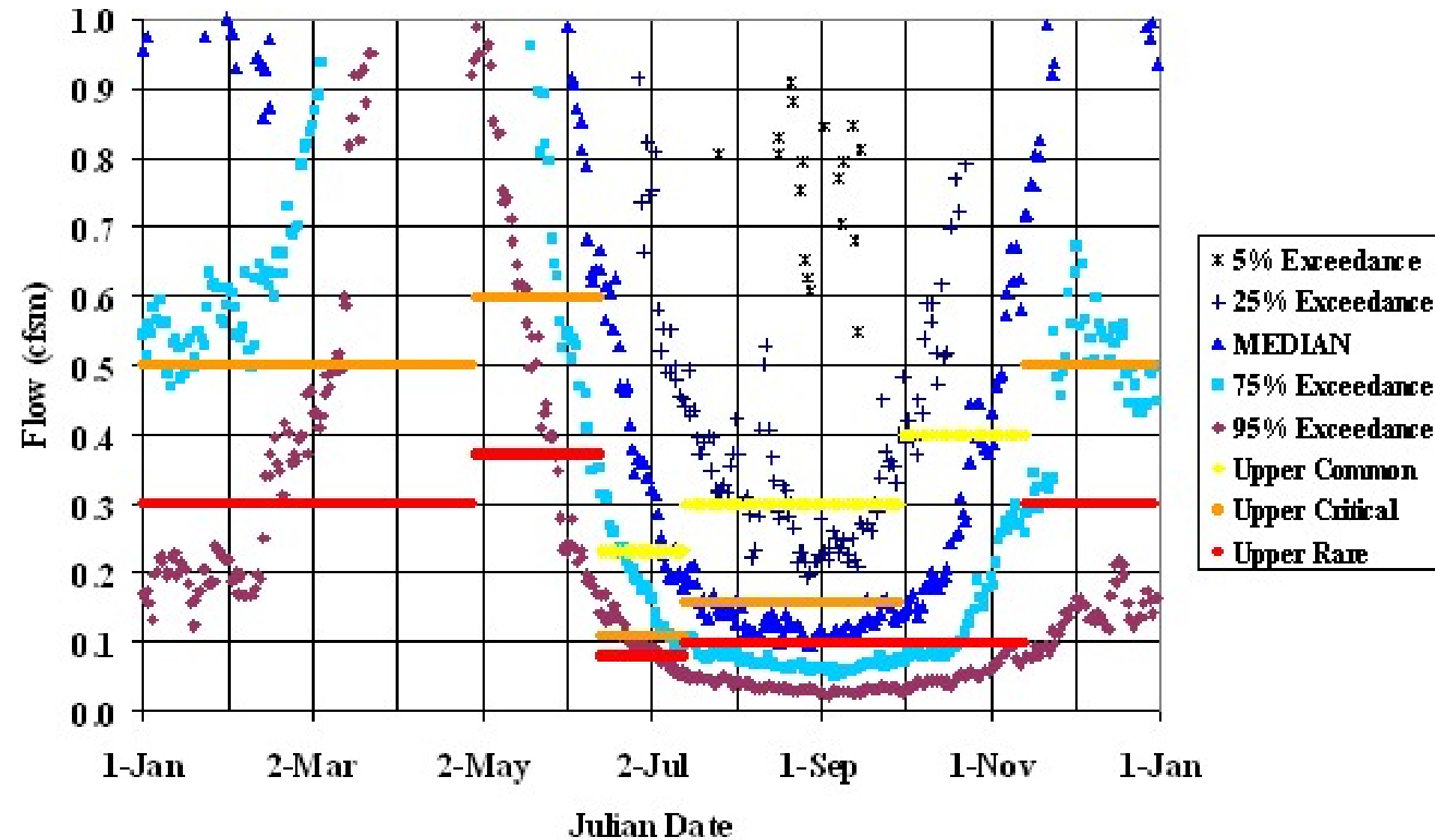


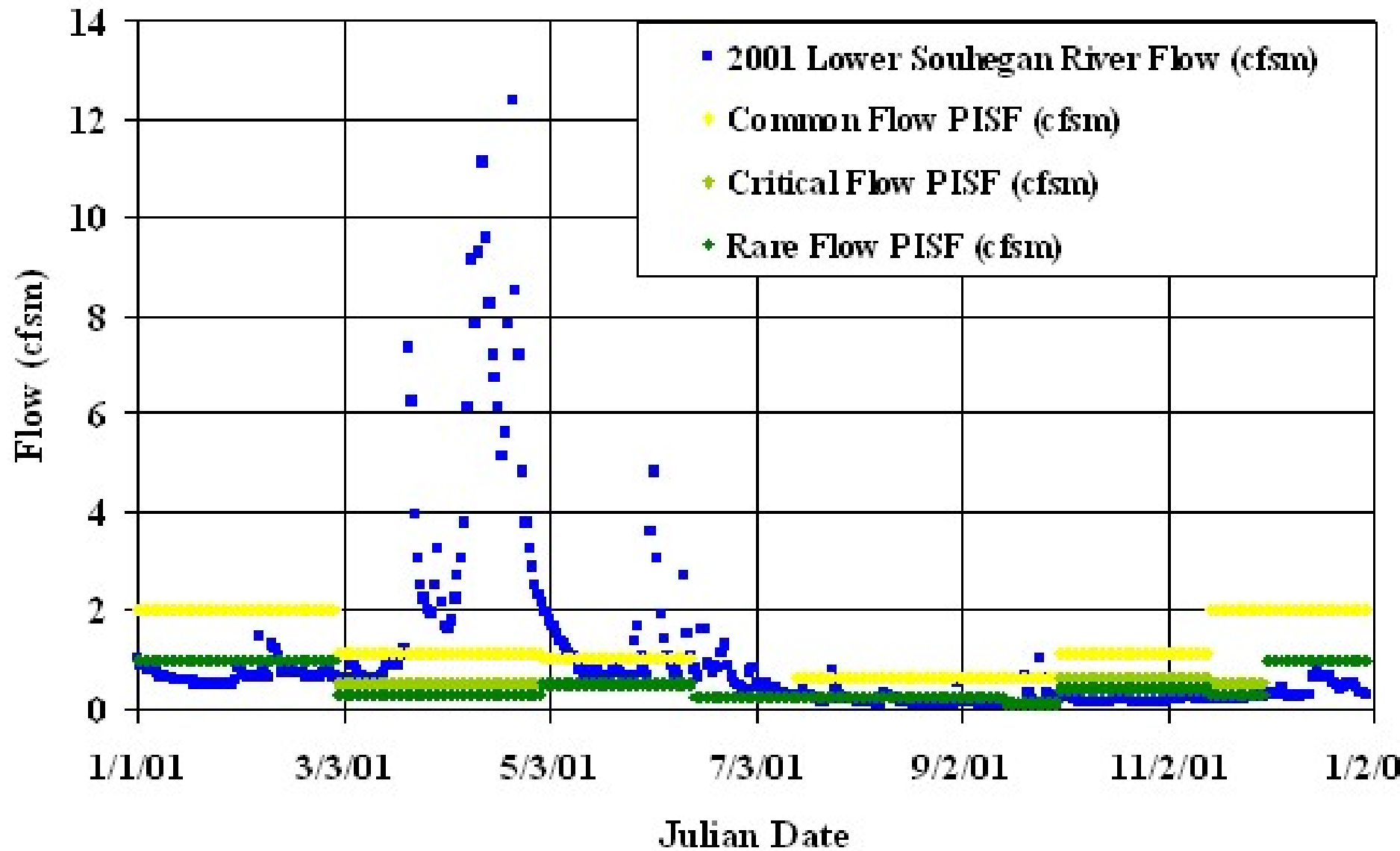


# Hydrology and the Ability of the Existing System to Meet the Proposed PISF

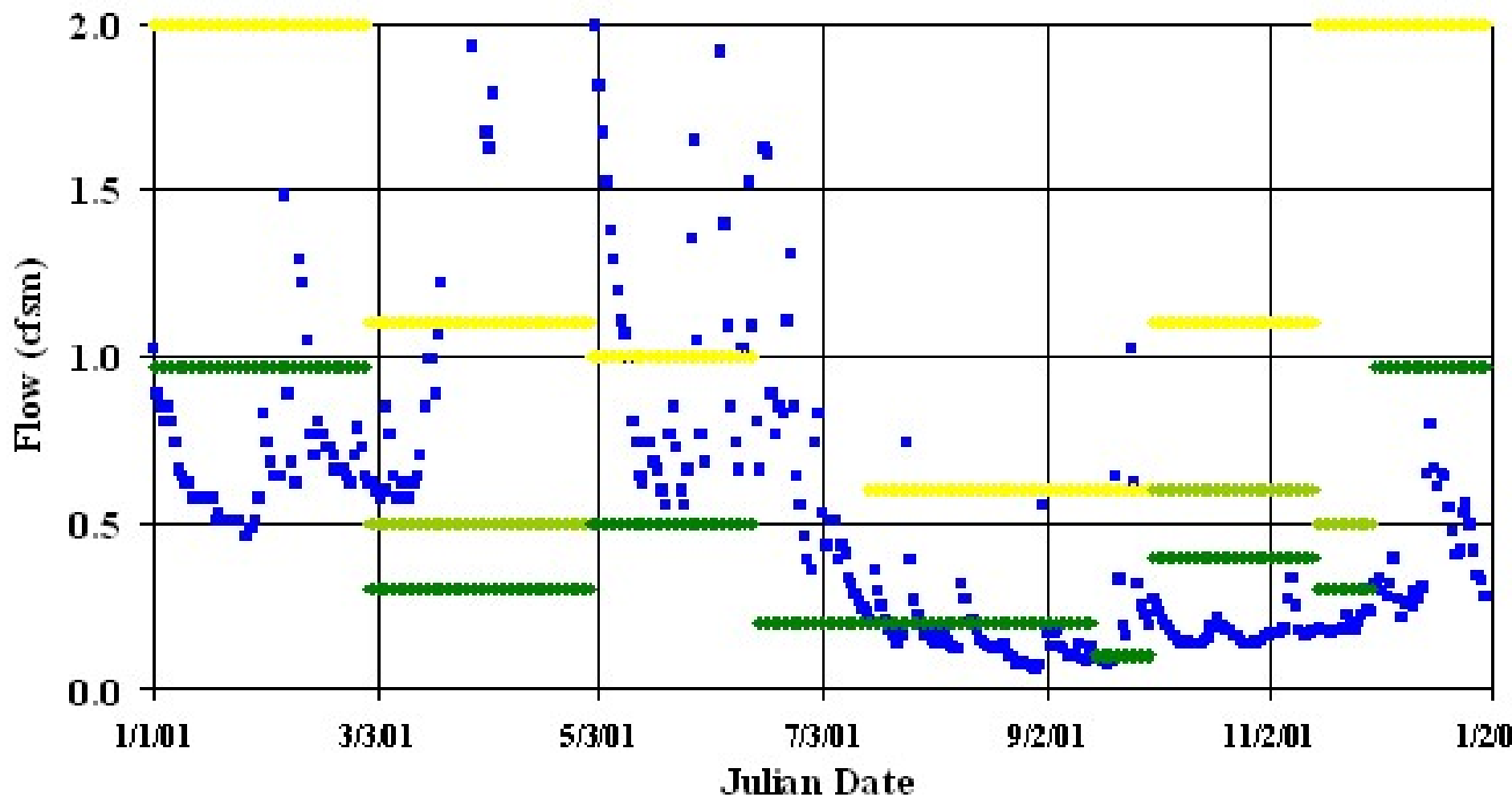
## Daily Frequency - Lower Souhegan River and High Flow PISF











- 2001 Lower Souhegan River Flow (cfsm)
- Common Flow PISF (cfsm)
- ◆ Critical Flow PISF (cfsm)
- ◆ Rare Flow PISF (cfsm)

# Important Points to Make as We Move into the Water Management Phase

- Significant habitat can be created without increasing flows, but through stream corridor restoration measures
- Increasing flows alone is not as important as also addressing high temperatures